Competency 2.8 **Radiation protection personnel shall demonstrate an expert level knowledge of the contents of the DOE *Radiological Control Manual*.**

1. Supporting Knowledge and Skills

a. Discuss the role of radiation protection personnel with respect to the guidance contained in the DOE *Radiological Control Manual*.

b. Discuss the purpose and guidance identified in Chapter 1 (Excellence in Radiological Control), including:
- DOE *Radiological Control Manual*
- Leadership in Radiological Control
- Improving Radiological Performance
- Contractor Radiological Control Organization
- Department Management

c. Discuss the purpose and guidance identified in Chapter 2 (Radiological Standards), including:
- Administrative Control Levels and Dose Limits
- Contamination Control and Control Levels
- Posting Requirements

d. Discuss the purpose and guidance identified in Chapter 3 (Conduct of Radiological Work), including:
- Planning Radiological Work
- Work Preparation
- Entry and Exit Requirements
- Radiological Work Controls
- Evaluation of Performance
- Special Applications
- Construction and Restoration Projects

e. Discuss the purpose and guidance identified in Chapter 4 (Radioactive Materials), including:
   - Radioactive Material Identification, Storage, and Control
   - Release and Transportation of Radioactive Material
   - Radioactive Source Controls
   - Solid Radioactive Waste Management
   - Control of Radioactive Liquids and Airborne Radioactivity
   - Support Activity

f. Discuss the purpose and guidance identified in Chapter 5 (Radiological Health Support Operations), including:
   - Handling Radiologically Contaminated Personnel
   - Radiological Monitoring and Surveys
   - Instrumentation and Calibration

g. Discuss the purpose and guidance identified in Chapter 6 (Training and Qualification), including:
   - General Employee Radiological Training
   - Radiological Worker Training
   - Radiological Control Technician Qualification
   - Other Radiological Training

h. Discuss the purpose and guidance identified in Chapter 7 (Radiological Records), including:
   - Employee Records
   - Radiological Control Procedures
   - Radiological Surveys and Instrument and Calibration Records

2. Summary

The DOE *Radiological Control Manual* offers detailed guidance for implementation of radiation protection in the DOE system. It establishes practices for the conduct of radiological control activities and states DOE's positions and views on the best courses of action currently available in the area of radiological controls. This manual is intended to be reissued in 1996 as a RadCon Technical Standard. The use of "shall" statements presently in the document will presumably change to "should" (or equivalent) statements.

3. Self-Study Scenarios/Activities and Solutions

Review

- DOE/EH-0256T (Revision 1), *Radiological Control Manual*.

Actions or situations were combined to create new incidents for the following scenarios from these references:

- *Operating Experience Weekly Summary 96-05*, January 26 through February 1, 1996, Event Number 4.
- *Operating Experience Weekly Summary 96-09*, February 24 through 29, 1996, Event Number 4.
- *Operating Experience Weekly Summary 96-10*, March 1 through 7, 1996, Event Number 9.

Scenario 1, Part A

At Facility X, the administrative control level is 500 mrem per year. A technician entered a radiologically controlled area to perform work that was infrequently conducted. He signed in on a Radiological Work Permit (RWP) before entering the area and proceeded to the work area. When he had finished his work and was leaving, he looked at his self-reading dosimeter (0 to 200 mR) and discovered that it was off-scale. The technician immediately notified a radiological control technician (RCT).

What actions should be performed by the RCT?

Your Solution:

Scenario 1, Part A Solution
(Any reasonable paraphrase of the following is acceptable.)

The actions performed by the RCT should include the following:

- Inform the technician's supervisor.
- Pull the technician's dosimetry.
- Restrict the technician from radiological area access pending the reading of the thermoluminescent dosimeter (TLD).
- Conduct an investigation of the following:
  - The Radiological Work Permit (RWP).
  - The pre-job estimate and the pre-job briefing.
  - The procedure for the work that was to be completed.

Scenario 1, Part B

From the RCT's investigation the following issues were identified:

- The technician's radiological training had not been updated.
- The technician had no pre-job briefing. He was simply informed to perform the work.
- The technician signed in on the wrong RWP.
- Based on the pre-job estimate:
  - The technician stayed in the area longer than was anticipated.
  - The RCT expected that the technician would receive a dose of 200 mrem.
  - The technician should have been provided additional dosimetry such as a self-reading dosimeter covering a wider exposure range than the one issued.
- The technician's actual dose of 270 mrem (from the TLD reading) was greater than the expected dose of 200 mrem.

What articles (sections) of the DOE *Radiological Control Manual* address the issues in Part A and Part B of Scenario 1?

***Your Solution*:**

Scenario 1, Part B Solution
(Any reasonable paraphrase of the following is acceptable.)

The following articles from DOE/EH-0256T (Revision 1), *Radiological Control Manual*, address the issues identified from the scenario:

- Article 211 defines an administrative control level of 2,000 mrem per year per person. In this case, the facility adopted an administrative control level of 500 mrem, which is considered to be a "challenging and achievable" level according to the Manual. As noted in this scenario, the worker received less than this dose limit.
- Article 313 discusses the attention and planning that should be promoted for infrequent or first-time operations. Included in this would be an As Low As Reasonably Achievable (ALARA) review by an appropriate committee and increased line and management oversight. It is conceivable that additional pre-job planning might have limited the worker's exposure to less than pre-job estimates.
- Articles 321 and 322 provide typical information that should be included on an RWP and the uses of an RWP, respectively.
- Articles 631-633 discuss the Radiological Worker Training requirements for access to radiological areas.
- Article 641 advocates training not only for normal or routine operations, but also situations where radiological conditions change during the course of performing a particular work function. Dose rates, for example, could increase as the job proceeds, underscoring the importance of recognizing, evaluating, and anticipating changing conditions that could affect a worker's exposure. Training requirements for radiological control technicians and supervisors are specified in Sections 642-644.

Scenario 2, Part A

A trained Rad Worker I detected contamination on his hands while exiting a work area. An RCT was called. The RCT determined that there were three other workers who were involved in the same work that day. Of the three, one had already gone home. No contamination was noted on the other two workers. The worker with the contaminated hands was decontaminated.

What actions should the RCT consider taking regarding the worker who had left the site?

Your Solution:

Scenario 2, Part A Solution
(Any reasonable paraphrase of the following is acceptable.)

The RCT should consider taking the following actions:

- Contact the employee and travel to the employee's home.
- Perform radiation monitoring on the employee, the employee's home, automobile, and any location where the employee has been after work.

Scenario 2, Part B

At the employee's home, the RCT detected two small areas of alpha contamination measuring 1,200 dpm on the heel of the employee's personal shoe and 300 dpm on the right pants leg. A follow-up investigation by the RCT revealed that:

- The employee entered a posted contamination area without reading the radiological postings.
- The postings were obscured.
- The employee entered the posted contamination area without wearing protective clothing.
- The employee had not signed the RWP.
- The employee had left the area and site without performing whole body frisking.
- The employee had not had the proper level of Rad Worker training.

What actions should be performed by the RCT?

***Your Solution*:**

Scenario 2, Part B Solution
(Any reasonable paraphrase of the following is acceptable.)

The RCT and employee should remove and properly bag the contaminated articles of clothing. The RCT should:

- Resurvey the employee.
- Take nasal smears from the employee.
- Write an incident report.

Activity

Which articles of the DOE *Radiological Control Manual* address the issues presented in Scenario 2, Parts A and B?

***Your Solution*:**

Activity Solution
(Any reasonable paraphrase of the following is acceptable.)

The following articles from DOE/EH-0256T (Revision 1), *Radiological Control Manual*, address the issues identified from the scenario:

- Chapter 1, Excellence in Radiological Control, provides guidance in establishing and maintaining control programs. Workers, for example, should have a proper regard for radiation and the use of radioactive materials (Article 122). Worker responsibilities are detailed in Article 123. In this scenario, procedures were violated that, in effect, resulted in a loss of control of radioactive material and a situation in which the general public could have been adversely affected. At least one of the workers had completed Rad Worker I training; however, according to Article 632, this level of training is not sufficient to allow a worker to enter contaminated (and other) areas. Article 613 discusses training requirements for Rad Workers, including time lines for retraining and refresher training. Retraining should be strongly considered in this case. Requirements for entry into contamination areas are specified in Article 335. This section reiterates that Rad Worker I training is not sufficient to allow access.
- Articles 335 and 338 also state that whole-body frisking be performed when exiting a contaminated area. Radiation monitoring was not performed in at least one instance.
- The use of an RWP is covered in Article 322, which notes that the RWP shall be signed prior to entry.
- Article 231 discusses posting requirements and their purpose. The fact that the postings were obscured violates this section of the DOE *Radiological Control Manual*.
- Personal protective equipment and clothing is required under Article 325 for entry into a contaminated area. The worker who left the site wore no protective clothing.
- Article 541 discusses handling personnel with radiologically contaminated skin.

4. Suggested Additional Readings and/or Courses

Courses
NOTE: See Appendix B for additional course information

- *Radiological Control Manual Training for Managers* -- Oak Ridge Institute for Science and Education.
- DOE/EH-0450 (Revision 0), *Radiological Assessors Training (for Auditors and Inspectors) - Applied Radiological Control*, sponsored by the Office of Defense Programs, DOE
- *Radiation Protection Functional Area Qualification Standard Training* -- GTS Duratek

NOTES: